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From Animals to AnimatsToward a Practice of Autonomous SystemsEnglish AnimalsDarwin Among the MachinesArtificial Life IXMy Treasury of Animal Tales and RhymesFrom Animals to Animats 3From Animals to Animats 11From Animals to Animats 4From Animals to Animats 3Animal Babies in Towns and CitiesTales from a Not-so-perfect Pet SitterFrom Animals to Animats 10So Human an AnimalAnimal Babies in Ponds and RiversFrom Animals to Animats 9Mobile RobotsThe Aeronautical JournalParallel Problem Solving from Nature--PPSN From Animals to Animats 2Evolvable SystemsFrom Animals to Animats 12From Animals to Animats 5From Animals to Animats 7From Animals to Animats 2Made-up MindsDesigning Autonomous AgentsFuzzy Techniques in Image ProcessingAnimal HappinessProceedings of the National Academy of Sciences of the United States of AmericaDoctor RatSoft Computing for Intelligent Robotic SystemsAdvances in Artificial LifeFrom Animals to Animats 13From Animals to Animats :Robot ShapingRobot Navigation from NatureDirectory of Published ProceedingsPrerational IntelligenceRobotics and Manufacturing

From Animals to Animats

Toward a Practice of Autonomous Systems

Research results using some of the most advanced soft computing techniques in intelligent robotic systems are presented. The main purpose of this book is to show how the power of soft computing techniques can be exploited in intelligent robotic systems. The main emphasis is on control system for a mobile robot, behavior arbitration for a mobile robot, reinforcement learning of a robot, manipulation of a robot, collision avoidance and automatic design of robots. This book will be useful for application engineers, scientists and researchers who wish to use some of the most advanced soft computing techniques in robotics.

English Animals

This pioneering book describes the development of a robot mapping and navigation system inspired by models of the neural mechanisms underlying spatial navigation in the rodent hippocampus. Computational models of animal navigation systems have traditionally had limited performance when implemented on robots. This is the first research to test existing models of rodent spatial mapping and navigation on robots in large, challenging, real world environments.

Darwin Among the Machines

foreword by Lashon Booker To program an autonomous robot to act reliably in a

dynamic environment is a complex task. The dynamics of the environment are unpredictable, and the robots' sensors provide noisy input. A learning autonomous robot, one that can acquire knowledge through interaction with its environment and then adapt its behavior, greatly simplifies the designer's work. A learning robot need not be given all of the details of its environment, and its sensors and actuators need not be finely tuned. Robot Shaping is about designing and building learning autonomous robots. The term "shaping" comes from experimental psychology, where it describes the incremental training of animals. The authors propose a new engineering discipline, "behavior engineering," to provide the methodologies and tools for creating autonomous robots. Their techniques are based on classifier systems, a reinforcement learning architecture originated by John Holland, to which they have added several new ideas, such as "mutespec," classifier system "energy,"and dynamic population size. In the book they present Behavior Analysis and Training (BAT) as an example of a behavior engineering methodology.

Artificial Life IX

A New York Times Notable Book of 1994! Highly respected author, philosopher, and animal trainer Vicki Hearne offers a treasure trove of animal anecdotes, all written in her unique and poetic style. Through entertaining stories about cats, horses, an ornamental carp, a scorpion, and tortoises, Hearne focuses on how each of these various creatures experiences happiness in its own special way. She takes issue with Ludwig Wittgenstein on lions and language, discusses the naming of pets, and considers the process of mourning a loved dog’s death.

My Treasury of Animal Tales and Rhymes

This book constitutes the refereed proceedings of the 9th International Conference on Simulation of Adaptive Behavior, SAB 2006. The 35 revised full papers and 35 revised poster papers presented are organized in topical sections on the animat approach to adaptive behaviour, perception and motor control, action selection and behavioral sequences, navigation and internal world models, learning and adaptation, evolution, collective and social behaviours, applied adaptive behavior and more.

From Animals to Animats 3

Nikki tries to be a pet sitter, but realizes it's harder work than she thought.

From Animals to Animats 11

From Animals to Animats 4

Made-Up Minds addresses fundamental questions of learning and concept invention by means of an innovative computer program that is based on the cognitive-developmental theory of psychologist Jean Piaget. Drescher uses Piaget's theory as a source of inspiration for the design of an artificial cognitive system

called the schema mechanism, and then uses the system to elaborate and test Piaget's theory. The approach is original enough that readers need not have extensive knowledge of artificial intelligence, and a chapter summarizing Piaget assists readers who lack a background in developmental psychology. The schema mechanism learns from its experiences, expressing discoveries in its existing representational vocabulary, and extending that vocabulary with new concepts. A novel empirical learning technique, marginal attribution, can find results of an action that are obscure because each occurs rarely in general, although reliably under certain conditions. Drescher shows that several early milestones in the Piagetian infant's invention of the concept of persistent object can be replicated by the schema mechanism.

From Animals to Animats 3

Collects folk tales featuring animals, including "The Ugly Duckling," "Puss in Boots," "The Three Billy Goats Gruff," and "The Frog Prince."

Animal Babies in Towns and Cities

This World Fantasy Award winner in the vein of Animal Farm delves into a lab worthy of a mad Nazi scientist—but run by a brilliantly sadistic rodent. In the annals of American literature, there has never been a character quite like Doctor Rat, PhD. From one of the most indispensable storytellers in speculative fiction, this biting satire introduces a narrator of learned charm and humor, and a twisted logic that is absolutely chilling. Doctor Rat is a credit to his species. A survivor of the most refined scientific experiments, now removed from the maze, he has become a valued and productive member of the academic community. When he must administer a lethal dose, he comforts his fellow rats with his compassionate slogan: “Death is freedom.” But everything changes when animals worldwide begin to rebel, refusing to accept their proper places in the natural order of things: as test subjects, pets, or food. And only Doctor Rat has the courage to defend mankind from the ungrateful animal kingdom. Hailed by the Los Angeles Times as “dazzlingly original” and “occasionally quite beautiful,” Doctor Rat is a sly and stylish indictment of fanaticism in mice and men. “A truly imaginative impresario . . . [Doctor Rat] teases your conscience with educated wit and versatile improvisation, not to mention the casual flick of the tail about to be cut off.” —Kirkus Reviews

Tales from a Not-so-perfect Pet Sitter

August 8-12, 1994, Brighton, England From Animals to Animats 3 brings together research intended to advance the fron tier of an exciting new approach to understanding intelligence. The contributors represent a broad range of interests from artificial intelligence and robotics to ethology and the neurosciences. Unifying these approaches is the notion of "animat" -- an artificial animal, either simulated by a computer or embodied in a robot, which must survive and adapt in progressively more challenging environments. The 58 contributions focus particularly on well-defined models, computer simulations, and built robots in order to help characterize and compare various principles and architectures capable of

inducing adaptive behavior in real or artificial animals. Topics include: - Individual and collective behavior. - Neural correlates of behavior. - Perception and motor control. - Motivation and emotion. - Action selection and behavioral sequences. - Ontogeny, learning, and evolution. - Internal world models and cognitive processes. - Applied adaptive behavior. - Autonomous robots. - Heirarchical and parallel organizations. - Emergent structures and behaviors. - Problem solving and planning. - Goal-directed behavior. - Neural networks and evolutionary computation. - Characterization of environments. A Bradford Book

From Animals to Animats 10

Proceedings of the May 1996 symposium. Topics include experimental results of operational space control on a dual-arm robot system, design and control of an anthropomorphic servopneumatic finger joint, robot control strategy for camera guidance in laparoscopic surgery, dense reconstruction using fix

So Human an Animal

Animal Babies in Ponds and Rivers

Is the human species becoming dehumanized by the condition of his environment? So Human an Animal is an attempt to address this broad concern, and explain why so little is being done to address this issue. The book sounds both an urgent warning, and offers important policy insights into how this trend toward dehumanization can be halted and finally reversed.

From Animals to Animats 9

This book constitutes the proceedings of the 13th International Conference on Simulation of Adaptive Behavior, SAB 2014, held in Castellón, Spain, in July 2014. The 32 papers presented in this volume were carefully reviewed and selected for inclusion in the proceedings. They cover the main areas in animat research, including the animat approach and methodology, perception and motor control, navigation and internal world models, learning and adaptation, evolution and collective and social behavior.

Mobile Robots

'A beautiful and bold debut' M.J. Hyland, author of the Man Booker-shortlisted Carry Me Down It's a long time since I've enjoyed any debut novel as much as English Animals. Its command of tone, narrative and character is so assured, and both its wit and perceptiveness about a certain kind of English life make it a joy to read' Amanda Craig English Animals is a brilliantly assured debut that fans of Nina Stibbe's writing will love. I opened my mouth to say something but she ran up the steps and into the house. I had imagined arriving at the house so many times, but it was never like this. I realised I knew nothing about these people. Richard and Sophie sounded like good names for good people. But they could be anything, they could be completely crazy. When Mirka gets a job in a country house in rural

England, she has no idea of the struggle she faces to make sense of a very English couple, and a way of life that is entirely alien to her. Richard and Sophie are chaotic, drunken, frequently outrageous but also warm, generous and kind to Mirka, despite their argumentative and turbulent marriage. Mirka is swiftly commandeered by Richard for his latest money-making enterprise, taxidermy, and soon surpasses him in skill. After a traumatic break two years ago with her family in Slovakia, Mirka finds to her surprise that she is happy at Fairmont Hall. But when she tells Sophie that she is gay, everything she values is put in danger and she must learn the hard way what she really believes in. English Animals is a funny, subversive, poignant and beautifully written novel about a doomed love affair, a certain kind of Englishness and prejudice.

The Aeronautical Journal

The Animals to Animats Conference brings together researchers fromethology, psychology, ecology, artificial intelligence, artificiallife, robotics, engineering, and related fields to furtherunderstanding of the behaviors and underlying mechanisms that allownatural and synthetic agents (animats) to adapt and survive inuncertain environments The Animals to Animats Conference brings together researchers from ethology, psychology, ecology, artificial intelligence, artificial life, robotics, engineering, and related fields to further understanding of the behaviors and underlying mechanisms that allow natural and synthetic agents (animats) to adapt and survive in uncertain environments. The work presented focuses on well-defined models--robotic, computer-simulation, and mathematical--that help to characterize and compare various organizational principles or architectures underlying adaptive behavior in both natural animals and animats.

Parallel Problem Solving from Nature--PPSN

This volume constitutes the refereed proceedings of the 11th International Conference on Simulation and Adaptive Behavior, SAB 2010, held in Paris and Clos Lucé, France, in August 2010. The articles cover all main areas in animat research, including perception and motor control, action selection, motivation and emotion, internal models and representation, collective behavior, language evolution, evolution and learning. The authors focus on well-defined models, computer simulations or robotic models, that help to characterize and compare various organizational principles, architectures, and adaptation processes capable of inducing adaptive behavior in real animals or synthetic agents, the animats.

From Animals to Animats 2

'Full of historical anecdotes . . . but this is much more than a history book. [George Dyson] weaves his threads together for a purpose. Using voices of the past and present, he describes a fresh and sometimes startling viewpoint of the emerging relationship between nature and machines. From vignettes about Olaf Stapledon, George Boole, John von Neumann, and Samuel Butler, a larger story develops in which the twin processes of intelligence and evolution are inseparably intertwined' Danny Hillis, Wired

Evolvable Systems

Proceedings from the ninth International Conference on Artificial Life; papers by scientists of many disciplines focusing on the principles of organization and applications of complex, life-like systems. Artificial Life is an interdisciplinary effort to investigate the fundamental properties of living systems through the simulation and synthesis of life-like processes. The young field brings a powerful set of tools to the study of how high-level behavior can arise in systems governed by simple rules of interaction. Some of the fundamental questions include: What are the principles of evolution, learning, and growth that can be understood well enough to simulate as an information process? Can robots be built faster and more cheaply by mimicking biology than by the product design process used for automobiles and airplanes? How can we unify theories from dynamical systems, game theory, evolution, computing, geophysics, and cognition? The field has contributed fundamentally to our understanding of life itself through computer models, and has led to novel solutions to complex real-world problems across high technology and human society. This elite biennial meeting has grown from a small workshop in Santa Fe to a major international conference. This ninth volume of the proceedings of the international A-life conference reflects the growing quality and impact of this interdisciplinary scientific community.

From Animals to Animats 12

Artificial life embodies a recent and important conceptual step in modem science:asserting that the core of intelligence and cognitive abilities is the same as the capacity forliving. The recent surge of interest in artificial life has pushed a whole range of engineeringtraditions, such as control theory and robotics, beyond classical notions of goal and planning intobiologically inspired notions of viability and adaptation, situatedness and operationalclosure.These proceedings serve two important functions: they address bottom-up theories ofartificial intelligence and explore what can be learned from simple models such as insects about thecognitive processes and characteristic autonomy of living organisms, while also engaging researchersand philosophers in an exciting examination of the epistemological basis of this new trend.FranciscoJ. Varela is Director of Research at CNRS in Paris, France. Paul Bourgine is Professor of ArtificialIntelligence at CEMAGREF, Antony, France.Topics include: Artificial Animals. Genetic Algorithms.Autonomous Systems. Emergent Behaviors. Artificial Ecologies. Immunologic Algorithms. Self-AdaptingSystems. Emergent Structures. Emotion And Motivation. Neural Networks. Coevolution. FitnessLandscapes Contributors include: H. Bersini. Domenico Parisi. Rodney A. Brooks. Christopher G.Langton. S. Kauffman. J.-L. Denenbourg. Pattie Maes. John Holland. T. Smithers. H. Swefel. H.Muhlenbein.

From Animals to Animats 5

From Animals to Animats 7

This volume contains 71 revised refereed papers, including seven invited surveys, presented during the Third European Conference on Artificial Life, ECAL '95, held in

Granada, Spain in June 1995. Originally AL was concerned with applying biologically inspired solutions to technology and with examining computational expertise in order to reproduce and understand life processes. Despite its short history, AL now is becoming a mature scientific field. The volume reports the state of the art in this exciting area of research; there are sections on foundations and epistemology, origins of life and evolution, adaptive and cognitive systems, artificial worlds, robotics and emulation of animal behavior, societies and collective behavior, biocomputing, and applications and common tools.

From Animals to Animats 2

More than sixty contributions in From Animals to Animats 2 byresearchers in ethology, ecology, cybernetics, artificial intelligence, robotics, and related fieldsinvestigate behaviors and the underlying mechanisms that allow animals and, potentially, robots toadapt and survive in uncertain environments. Jean-Arcady Meyer is Director of Research, CNRS, Paris.Herbert L. Roitblat is Professor of Psychology at the University of Hawaii at Manoa. Stewart W.Wilson is a scientist at The Rowland Institute for Science, Cambridge,Massachusetts. Topics covered: The Animat Approach to Adaptive Behavior,Perception and Motor Control, Action Selection and Behavioral Sequences, Cognitive Maps and InternalWorld Models, Learning, Evolution, Collective Behavior.

Made-up Minds

These sixty contributions from researchers in ethology, ecology, cybernetics, artificial intelligence, robotics, and related fields delve into the behaviors and underlying mechanisms that allow animals and, potentially, robots to adapt and survive in uncertain environments. They focus in particular on simulation models in order to help characterize and compare various organizational principles or architectures capable of inducing adaptive behavior in real or artificial animals. Jean-Arcady Meyer is Director of Research at CNRS, Paris. Stewart W. Wilson is a Scientist at The Rowland Institute for Science, Cambridge, Massachusetts.

Designing Autonomous Agents

Fuzzy Techniques in Image Processing

Animal Happiness

This book constitutes the proceedings of the 12th International Conference on Simulation of Adaptive Behaviour, SAB 2012, held in Odense, Denmark, in August 2012. The 22 full papers as well as 22 poster papers included in this volume were carefully reviewed and selected from 66 submissions. They are organized in topical sections named: animat approach and methodology; perception and motor control; evolution; learning and adaptation, and collective and social behaviour.

Proceedings of the National Academy of Sciences of the United

States of America

Since time immemorial, vision in general and images in particular have played an important and essential role in human life. Nowadays, the field of image processing also has numerous scientific, commercial, industrial and military applications. All these applications result from the interaction between fun damental scientific research on the one hand, and the development of new and high-standard technology on the other hand. Regarding the scientific com ponent, quite recently the scientific community became familiar with "fuzzy techniques" in image processing, which make use of the framework of fuzzy sets and related theories. The theory of fuzzy sets was initiated in 1965 by Zadeh, and is one of the most developed models to treat imprecision and uncertainty. Instead of the classical approach that an object belongs or does not belong to a set, the concept of a fuzzy set allows a gradual transition from membership to nonmembership, providing partial degrees of member ship. Fuzzy techniques are often complementary to existing techniques and can contribute to the development of better and more robust methods, as has already been illustrated in numerous scientific branches. With this vol ume, we want to demonstrate that the introduction and application of fuzzy techniques can also be very successful in the area of image processing. This book contains high-quality contributions of over 30 field experts, covering a wide range of both theoretical and practical applications of fuzzy techniques in image processing.

Doctor Rat

September 9th-13th, 1996, Cape Cod, MassachusettsFrom Animals to Animats 4 brings together the latest research at the frontier of an exciting new approach to understanding intelligence. The contributors represent a broad range of interests from artificial intelligence and robotics to ethology and the neurosciences. Unifying these approaches is the notion of 'animat' -- an artificial animal, either simulated by a computer or embodied in a robot, which must survive and adapt in progressively more challenging environments. The 66 contributions focus particularly on well-defined models, computer simulations, and built robots in order to help characterize and compare various principles and architectures capable of inducing adaptive behavior in real or artificial animals.Major topics, all from the perspective of adaptive behavior, include: The Animat Approach to Adaptive Behavior, Perception and Motor Control, Action Selection and Behavioral Sequences, Internal World Models and Navigation, Motivation and Emotions, Learning, Evolution, Coevolution, Collective Behavior.

Soft Computing for Intelligent Robotic Systems

Features beautiful, heartwarming photographs of animal babies with their parents in freshwater habitats.

Advances in Artificial Life

More than sixty contributions in From Animals to Animats 2 byresearchers in ethology, ecology, cybernetics, artificial intelligence, robotics, and related

fieldsinvestigate behaviors and the underlying mechanisms that allow animals and, potentially, robots toadapt and survive in uncertain environments. Jean-Arcady Meyer is Director of Research, CNRS, Paris.Herbert L. Roitblat is Professor of Psychology at the University of Hawaii at Manoa. Stewart W.Wilson is a scientist at The Rowland Institute for Science, Cambridge,Massachusetts. Topics covered: The Animat Approach to Adaptive Behavior,Perception and Motor Control, Action Selection and Behavioral Sequences, Cognitive Maps and InternalWorld Models, Learning, Evolution, Collective Behavior.

From Animals to Animats 13

Welcome to the proceedings of the Tenth International Conference on Simulation of Adaptive Behavior (SAB 2008). A symbolic creature in the SAB 2008 poster is based on GAKUTENSOKU, Japan's first modern robot created in 1928 by Makoto Nishimura. The robot, Gakutensoku (or "learning from natural law"), "was 7' 8'' tall, painted gold, could open and close its eyes, could smile, could puff out its cheeks, and at the beginning of each performance would touch its mace to its head and then begin to write (from http://www. robmacdougall. org/index. php/2008/04/gakutensoku/). " Gakutensoku was actuated by pneumatics and seems to have been "a sort of early Japanese animatronics. " Designed 80 years ago, it still stimulates researchers' minds. This year, we received 110 submissions, among which we selected 30 for oral pr- entations and 21 for posters. In the main conference, we had four very interesting plenary talks: "Modelling Adaptive and Intelligent Behaviour: Some Historical and Epistemological Issues" by Roberto Cordeschi, "Insect-Machine Hybrid System for Understanding an Adaptive Behavior" by Ryohei Kanzaki, "Body Shapes Brain – Emergence and Development of Behavior and Mind from Embodied Interaction Dynamics" by Yasuo Kuniyoshi, and "Thinking and Learning Close to the Sensory- Motor Surface Creates Knowledge That Transcends the Here and Now" by Linda Smith. On the second day, we had a special joint session with the British Council featuring special talks by Giacomo Rizzolatti and Ron Chrisley followed, by a panel discussion. After the main conference, we had a workshop and two tutorials.

From Animals to Animats :

Robot Shaping

Designing Autonomous Agents provides a summary and overview of the radicallydifferent architectures that have been developed over the past few years for organizing robots.These architectures have led to major breakthroughs that promise to revolutionize the study ofautonomous agents and perhaps artificial intelligence in general.The new architectures emphasizemore direct coupling of sensing to action, distributedness and decentralization, dynamic interactionwith the environment, and intrinsic mechanisms to cope with limited resources and incompleteknowledge. The research discussed here encompasses such important ideas as emergent functionality,task-level decomposition, and reasoning methods such as analogical representations and visualoperations that make the task of perception more realistic.Pattie Maes is Research Associate at theArtificial

Intelligence Laboratory of the University of Brussels and Visiting Faculty Member at theArtificial Intelligence Laboratory at MIT.Contents: A Biological Perspective on Autonomous AgentDesign, Randall D. Beer, Hillel J. Chiel, Leon S. Sterling. Elephants Don't Play Chess, Rodney A.Brooks. What Are Plans For? Philip E. Agre and David Chapman. Action and Planning in EmbeddedAgents, Leslie Pack Kaelbling and Stanley J. Rosenschein. Situated Agents Can Have Goals, PattieMaes. Exploiting Analogical Representations, Luc Steels. Internalized Plans: A Representation forAction Resources, David W. Payton. Integrating Behavioral, Perceptual, and World Knowledge inReactive Navigation, Ronald C. Arkin. Symbol Grounding via a Hybrid Architecture in an AutonomousAssembly System, Chris Malcolm and Tim Smithers. Animal Behavior as a Paradigm for Developing RobotAutonomy, Tracy L. Anderson and Max Donath.

Robot Navigation from Nature

The focus of prerational intelligence is on the way animals and artificial systems utilize information about their surroundings in order to behave intelligently; the premise is that logic and symbolic reasoning are neither necessary nor, possibly, sufficient. Experts in the fields of biology, psychology, robotics, AI, mathematics, engineering, computer science, and philosophy review the evidence that intelligent behaviour can arise in systems of simple agents interacting according to simple rules; that self-organization and interaction with the environment are critical; and that quick approximations may replace logical analyses. It is argued that a better understanding of the intelligence inherent in procedure like those illustrated will eventually shed light on how rational intelligence is realised in humans. Readership: Scientifically literate general readers and scientists in all fields interested in understanding and duplicating biological intelligence.

Directory of Published Proceedings

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Prerational Intelligence

Animal Babies in Towns and Cities looks at six young animals that live among us in our own backyards. Families of red foxes, gray squirrels, raccoons, opossums, peregrine falcons, and skunks are brought to life with delightful photography and lively text that will charm young children as they learn about the world around them.

Robotics and Manufacturing

Proceedings of the Seventh International Conference on Simulation of Adaptive Behavior The Simulation of Adaptive Behavior Conference brings together researchers from ethology, psychology, ecology, artificial intelligence, artificial life, robotics, computer science, engineering, and related fields to further understanding of the behaviors and underlying mechanisms that allow adaptation and survival in uncertain environments. The work presented focuses on robotic and computational experimentation with well-defined models that help to characterize and compare alternative organizational principles or architectures underlying adaptive behavior in both natural animals and synthetic animats.